A Model for Mapping Competence at Hospitals

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ABSTRACT
In the recent years patients-related services have been highly concerned with achieving high quality assurance in healthcare. A hospital needs complicated job process to provide healthcare services for patients. Most of healthcare services in hospitals require the participation of various medical professions. However, team development is difficult in hospital professions, while task overlapping and overlapping easily occur. The purpose of this study is to determine the method to map an employee to a hospital job. The model proposed in this paper handles two current issues: (a) Hospital jobs are not clearly defined, and (b) the method for mapping employees to jobs is not clearly defined. Two approaches will be used in relation to these issues: (a) understanding of job processes through two perspectives: Unit process and Process flow, and (b) Mapping (of employees) based on competence. In this paper, we have provided a detailed explanation of two of the functions of this model. Lastly we have applied the model to an actual hospital to illustrate the effectiveness of the model.

1. INTRODUCTION
1.1. Background
Jobs in healthcare are specialized and a hospital’s organization structure is based on job classification. This structure differs from that of the functional organization prevalent in general industry (Figure1).

Thus, in hospitals, role assignment based on healthcare specialties of employees is necessary with regard to the job processes in order to achieve quality assurance [1][2][3]. However, at present, healthcare staffs are unable to know or share information with each other regarding the same job process for the same patient. For example, in a clinical testing process, a doctor is unaware of the process from ordering to accepting the results of a clinical test; this process resembles a black box. This implies that doctors are unable to analyze or improve the job processes in order to achieve continuous quality assurance. Therefore, it is necessary to design job processes so as to promote collaboration, making the most of the expertise shared among different employees.

1.2. Purpose
The purpose of this study is to determine the method to map an employee to a hospital job. We call this method “a mapping model of employee on hospital job’. In this paper, we have provided a detailed explanation of two of the functions of the model.
2. CONCEPTS AND FUNCTIONS OF THE MODEL

2.1. Current Problems in Mapping

We have extracted two current issues to map employees to hospital jobs through investigation at an actual hospital and by looking at the existing literature [4][5]. The current problems in mapping are as follow:

1. Jobs to be mapped are not defined

In order to map employees, hospital jobs have to be defined. However, hospital jobs are not defined because of complexity. Complexity is derived from characteristics of hospital such as diverseness of patients’ demand to healthcare services.

2. Mapping is inadequate not only from the perspective of safety but also from the perspective of utilizing employees efficiently

In order to map employees to hospital jobs adequately, both of safety and efficient utilization of employees are considered. Presently, there are some adverse events derived from mapping inexperienced healthcare staff to some jobs or uneven mapping of healthcare staff.

2.2. Concepts of the Model

Two current problems referred in 2.1 point to two concepts which our model has to include. In order to deal with unclear job type definition, a concept of describing hospital jobs in structure is required. Secondly, in order to deal with the inadequacy in mapping, a concept of mapping based on competence is needed. The second concept of the model is that of mapping based on competence. Competence is the grounds for mapping employees to hospital jobs. Therefore, the concept can be deployed into three functions. These functions are combinations of two factors within job, employee and competence (shown in Figure2). The first function is the determination of the required competence needed in order to perform jobs. The second is the determination of the possessed competence of employees performing jobs. The third is the Selection of the appropriate candidate for a particular hospital job through the comparison of Required Competence and Possessed Competence. (Table1)

Table 1 - Function of the Model corresponding to the Concept of this study

<table>
<thead>
<tr>
<th>Concepts</th>
<th>Function of the Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description of Hospital Jobs in structure</td>
<td>Description of Hospital Jobs in structure (same to the concept)</td>
</tr>
<tr>
<td>Mapping based on Competence</td>
<td>Determination of the Required Competence in Performing Jobs</td>
</tr>
<tr>
<td></td>
<td>Determination of the Possessed Competence of Employees in Performing Jobs</td>
</tr>
<tr>
<td></td>
<td>Selection of the appropriate candidate for a particular hospital job through the comparison of Required Competence and Possessed Competence</td>
</tr>
</tbody>
</table>

Figure 2 – Image of the entire model

2.3. Functions of the Model

In this paper, we explain two of the functions of the model: Description of hospital jobs and determination of the required competence in performing jobs.

2.3.1. Description of Hospital Jobs
In order to describe hospital jobs in structure, we proceed as follows:

(i) Introduce the perspectives derived from ‘Process Approach’ [4]
(ii) Extract characteristics of hospital jobs

For the purpose of structuring, the perspectives of ‘Unit Process’ and ‘Process Flow’ shown in Figure 3 are used.

The Process Flow perspective expresses the jobs as connections of Unit Processes which consist of five elements. The perspective of Unit Process shows what type of jobs is implemented for the production of an output. This perspective shows not only tasks which transform inputs into outputs, but also other types of job such as jobs in terms of resources and control. The job in terms of resources means the action for supporting ‘tasks’, such as actions of preparation, procurement or maintenance of resources. Resources consist of human, material, and intellectual resources. A job in terms of control means the actions for monitoring or measuring ‘tasks’ and for correcting. Usually (where this model is not used), only jobs of tasks are grasped, while the unit process can introduce other types of jobs via elements such as resources and control.

![Figure 3 Jobs Perspective; ‘Unit Process’ and ‘Process Flow’](image)

Based on the jobs perspective of ‘Unit Process’, we have defined ‘actions’ as the implementation of each component of unit process. Each action depends on a component of the unit process, which determines the action’s type. Actions corresponding to the unit process have been introduced as represented in Fig. 4; each block denotes an action type. The content of each action type is defined in Fig.4.

![Figure 4. Content of each action](image)

Next, we have considered characteristics of hospital jobs. At first, we classified hospital jobs from the perspective of service provision: Service consumer, service content, and service supplier. In the case of a hospital, the service consumer is a patient, the service content is healthcare service, and the service supplier is a hospital organization. Within these aspects, the following characteristics make quality assurance of hospital jobs difficult: service
consumer is various, service content intervenes in human bodies, and service supplier is specialized. Specifically, seven characteristics have been extracted. These characteristics and their implications are shown in Table 2.

Table 2 - Characteristics of hospital jobs

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Service consumer</th>
<th>Service content</th>
<th>Service supplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>service consumer</td>
<td>Various</td>
<td>Intervene in bodies</td>
<td>Specialized</td>
</tr>
<tr>
<td>① Each Patient is different</td>
<td>③ Pain-inducing intervention</td>
<td>⑥ Requires specialists</td>
<td>⑦ Organization structured on fields of expertise rather than function</td>
</tr>
<tr>
<td>② A Patient’s condition is dynamic</td>
<td>④ Failure/mistakes are beyond repair</td>
<td>⑤ Urgency</td>
<td></td>
</tr>
</tbody>
</table>

2.3.2. Determination of the Required Competence

We have determined the required competence to implement hospital jobs by two aspects: action type and level classification. Level classification depends on whether an employee can implement action by oneself or not.

3. THE DEVELOPED MODEL

3.1. The Entire Model

In order to map employees to hospital jobs, we can refer to the Model for Mapping Employees to Hospital Jobs, proposed by Shimono et al. This model has provided the entire framework for mapping employees to hospital jobs based on competences. The model is composed of four steps shown in Figure 5 and Table 3.
3.2. Step1: Description of Hospital Jobs

We specified items to be described in hospital job processes: Process flow, components of unit process, and actions. These items take the seven characteristics of hospital jobs into consideration.

**Process Flow**

The Process flow is the connection of all unit processes. Because each patient is unique and dynamic, and in situations of emergency, it is sometimes necessary to add new unit processes to the process flow.

**Input and Output**

Inputs and outputs are described in terms of materials, information and condition. For information, the media is also specified.

**Resource**

Resource is composed of human resources, material resources, and intellectual resources. Material resources are medicines, machines, information system, and environment. And intellectual resources are instruction manuals and know-how shared within staffs.

**Control**

Control is described in terms of performance indicators used for monitoring input, output, and resource check, as well as other necessary assessments. When follow-up actions have been taken due to performance indicators outside tolerated values, these are described as ‘Corrections’.

**Action**

In each unit process, actions which fit the job being described are selected from the actions listed in Figure 4.

3.3. Step2: Determination of the Required Competence

We designed a competence table depending on types of jobs and the level. (Table 4)

<table>
<thead>
<tr>
<th>Level</th>
<th>Competence depending on the level</th>
<th>Competence depending on the type of job</th>
<th>Procedure</th>
<th>Description of Hospital Jobs in structure</th>
<th>Determination of the Required Competence</th>
<th>Determination of the Possessed Competence of Employees</th>
<th>Selection of the appropriate candidate</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.</td>
<td>Ability to implement in complex cases by oneself</td>
<td>Ability to modify and revise resources on the fly, using judgment on the specific input</td>
<td>Ability to modify and revise resources on the fly, using judgment on the specific input</td>
<td>Application of the Concept of Unit Process and Process Flow</td>
<td>Listing required Competence on each action type by level classification</td>
<td>Linking Possessed Competence and Employee occupation</td>
<td>1. Comparison of Required Competence and Possessed Competence. 2. Selection of the appropriate candidate</td>
</tr>
<tr>
<td>3.</td>
<td>Ability to implement in standard cases by oneself and to arrange the experienced for help in complex cases</td>
<td>Ability to prepare the required resources, basing judgment on a typical input pattern</td>
<td>Ability to prepare the required resources, basing judgment on a typical input pattern</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Ability to arrange the experienced for help in standard cases and to implement within the instructions of experienced staff</td>
<td>Ability to prepare the required resources, basing judgment on a typical input pattern</td>
<td>Ability to prepare the required resources, basing judgment on a typical input pattern</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Ability to implement with on-site help</td>
<td>Ability to handle the resources</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. APPLICATION AND VALIDATION OF THE MODEL

We applied the constructed model step by step to a job process in a hospital selected for...
a case study of a clinical testing process (hospital A), and validated the constructed model based on criteria of adequacy and effectiveness.

4.1. The Result of Application

We described a clinical testing process using a flow chart shown in Table 5. This Process starts from order of clinical testing by a doctor to testing samples by clinical technicians.

Table 5 – The Result of Job Description Applied for a Clinical Testing Process

<table>
<thead>
<tr>
<th>Unit Process</th>
<th>Input</th>
<th>Action</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prep for sampling</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prep at patient</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Taking Samples</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delivery</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sorting</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prep of Inspection</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspection</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Testing Samples</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4.2. The Result of the Competence

We determined the required competences to implement a clinical test jobs. Table 6 shows a part of results of the required competence: a unit process of ‘Testing Samples’.

Table 6 – The Result of Applying the Competence List for a Clinical Testing Process
4.3. Validation of the Model

We validated the constructed model based on criteria of adequacy and effectiveness through interview to management staff who are experienced on site.

Through Adequacy we judged whether the model was able to produce the correct output or not. In order to judge the correctness of the output, we compared the output of the model to the currency in hospital A. If they are the same, the output of the model is potentially correct. If the outputs are different, the cause for difference has to be examined.

Through Effectiveness the staff who has valid the model judged whether the model enhanced the safety and efficiency of human resources or not. We considered the result of the validation of adequacy described above. As a result of that, the staff said validity of the model.

5. DISCUSSION

5.1. Meaning of the Model

In the case examined, the hospital possesses a system to check the competence of employees. This system functions as part of the education of employees. However, there is no comprehensive system to evaluate competence in order to map employees on jobs. In this study, we proposed the framework of mapping based on the competences and the methodologies of hospital job description and determination of required competence to implement hospital jobs.

5.2. Future Issues

The constructed model was shown to be effective in the case of its application simple case such as jobs of clinical test. In order to apply it to complicated jobs in a hospital, it has to be further elaborated.

Since the constructed model is based on the job description via the perspective of unit process, the degree of job description clarity is the base for further elaboration. The required level of competence to do jobs is related to this level of clarity. The relation is shown in Table 7. Simply put, complicated jobs have many optional procedures to be implemented. The more complicated the job process is, the higher level of competence is required.

<table>
<thead>
<tr>
<th>The degree of job description along the concept of unit process</th>
<th>The required level of competence to do jobs</th>
</tr>
</thead>
<tbody>
<tr>
<td>simple (Job process is standardized)</td>
<td>basic</td>
</tr>
<tr>
<td>Complicated (Job process has plural options to output)</td>
<td>advanced</td>
</tr>
<tr>
<td>Complicated (Job process needs successive decision-making)</td>
<td></td>
</tr>
</tbody>
</table>

Table 7 - The Concept for Elaborating the Model

References